Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference B 14077 JL	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FR2003/050044	International filing date (*day/month/year*) 01 septembre 2003 (01.09.2003)	Priority date (*day/month/year*) 03 septembre 2002 (03.09.2002)
International Patent Classification (IPC) or national classification and IPC H01L 21/76		
Applicant COMMISSARIAT A L'ENERGIE ATOMIQUE		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 26 mars 2004 (26.03.2004)	Date of completion of this report 07 December 2004 (07.12.2004)
Name and mailing address of the IPEA/EP Facsimile No.	Authorized officer Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FR2003/050044

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed

☒ the description:

pages 1-14, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the claims:

pages 1-6, as originally filed

pages _____, as amended (together with any statement under Article 19

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the drawings:

pages 1/2,2/2, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☐ the sequence listing part of the description:

pages _____, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

V. **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-5	YES
	Claims	6	NO
Inventive step (IS)	Claims		YES
	Claims	1-6	NO
Industrial applicability (IA)	Claims	1-6	YES
	Claims		NO

2. Citations and explanations

This report makes reference to the following documents:

D1: VINOD K N ET AL: "FABRICATION OF LOW DEFECT DENSITY 3C-SIC ON SIO2 STRUCTURES USING WAFER BONDING TECHNIQUES" JOURNAL OF ELECTRONIC MATERIALS, WARRENDALE, PA, US, Vol. 27, No. 3, March 1998 (1998-03), pages L17-L20, XP009003060

D2: US-B-6 328 796 (HOBART KARL D ET AL) 11 December 2001 (2001-12-11)

D3: US-A-5 880 491 (NAMAVAR FEREYDOON ET AL) 9 March 1999 (1999-03-09)

2. The application does not meet the requirements of PCT Article 6 because claims 1, 5 and 6 are unclear.

2.1 Claim 1 relates to the epitaxial growth of a 6H or 4H polytype on a 6H or 4H polytype layer, respectively, if the support is made of Si, at a temperature of 1350°C or more. However, the description gives the impression that this temperature is insufficient for depositing such polytypes (cf. page 4, lines 19-21). This lack of agreement between the claim and the description raises doubts as to the subject matter for which protection is sought. The claim is therefore unclear (PCT Article 6) and/or the application is insufficiently described.

2.2 Claim 5 refers back to claim 1, which is unclear, and is therefore also unclear.

2.3 Independent claim 6 is unclear in that it defines a product (a semiconductor device) as being produced on a composite substrate of the SiCOI type, which is defined in terms of a process and not of its inherent technical features, yet the process itself is defined in an unclear manner.

3. The following report was established provided that claims 1, 5 and 6 were rightly understood.

Claims 1-5

3.1 The present application does not meet the requirements of PCT Article 33(1) because the subject matter of claim 1 does not involve an inventive step (PCT Article 33(3)).

3.1.1 Document D1 is considered to constitute the prior art closest to the subject matter of claim 1 and describes (pages L18-L19) a process for manufacturing a composite substrate of the SiCOI type comprising the following steps:

- providing an initial substrate comprising a Si support which carries a SiO_2 layer to which is applied a thin 3C-SiC layer,
- the epitaxial growth of 3C-SiC on the thin SiC layer at a temperature close to the melting point of Si (1410°C).

Consequently, the subject matter of claim 1 differs from that known process in that 3C-SiC is epitaxially grown at a temperature of 1350°C or more.

A person skilled in the art aware of the manufacturing process described in D1 would obviously consider carrying

out epitaxial growth at a temperature ranging from 1380 to 1405°C, since D1 underlines the importance of a temperature close to the melting temperature of silicon.

3.1.2 A person skilled in the art aware of the manufacturing process described in D1 would consider replacing the Si support by a SiC support, since this modification is normal trade practice and its advantages are easily foreseeable, especially since D2 describes a process for manufacturing a composite 3C-SiC/SiO_2/SiC substrate comprising the transfer after application by gluing of a thin 3C-SiC layer and the epitaxial growth of 3C-SiC on that layer.

3.1.3 A person skilled in the art aware of the manufacturing process described in D1 would obviously consider, if the support was made of Si, the epitaxial growth of a 6H or 4H polytype in the same temperature conditions as for the 3C polytype (1380-1405°C, cf. 3.1.1).

3.2 The subject matter of dependent claims 2-5 does not meet the requirements of PCT Article 33(3) for inventive step.

3.2.1 Claims 2-3
D1 describes a preparation step that precedes the epitaxial growth step and consists in subjecting the surface of the thin 3C-SiC layer to polishing, etching and hydrogen attack.

3.2.2 Claim 4
If necessary, a person skilled in the art would epitaxially deposit a plurality of 3C-SiC layers; this would be a mere repetition of the deposition process

described in D1.

3.2.3 Claim 5

- the use of a composite substrate of the SiCOI type to produce semiconductor devices is known from D1 (cf. conclusion), the composite substrate being produced by a process which comprises providing a Si substrate which carries a SiO_2 layer to which is applied a 3C-SiC layer, and the epitaxial growth of 3C-SiC;
- a person skilled in the art would also naturally consider the use of a 3C-SiCOI substrate, if the support was made of SiC, or of a 6H, 4H-SiCOI substrate, if the support was made of Si.

Claim 6

3.3 The subject matter of claim 6 does not meet the requirement of PCT Article 33(2) for novelty. The semiconductor devices produced on a composite substrate of the SiCOI type are known from:

- D1, D3 (SiC of the 3C polytype and Si as the support);
- D2 (SiC of the 3C polytype and SiC as the support; cf. column 9, line 13 - column 10, line 32).

3.4 The subject matter of claim 6 does not involve an inventive step (PCT Article 33(3)). A person skilled in the art would not need to be inventive to replace the 3C polytype by another polytype (4H or 6H) in the semiconductor devices known from D1, D2 or D3.

4. Claims 1-6 meet the requirements of PCT Article 33(4).